

A Study on the Food Hygiene Knowledge, Attitude and Practice of Directors and Teachers in the Home Day Care Centers

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Abstract: This study investigated the food hygiene knowledge, attitude and practice of the home day care center directors and teachers in Cheongju area to see if there is a necessity of safety management and hygiene education about the food service provided for the children. The result of investigating the food hygiene knowledge shows that the rate of correct answers was low in items such as the proper temperature of the refrigerator (35.6%) and the freezer (31.3%) and the proper storage temperature for the hot cooked food (9.8%) and the cold food (36.2%). The result of conducting crossover analysis of the answers for the food hygiene knowledge about the hygiene education shows that the distribution of the correct answer percentage between a group that has had hygiene education and one that has not showed a significant difference ($p < 0.001$) in items such as “the possibility of causing food poisoning by the cook with digestive disorder”, “the proper temperature of the refrigerator and the freezer” and “the proper storage temperature of the cooked food”. As for the food hygiene attitude, the rate of the hygiene attitude was low in “prohibition of wearing accessories when dealing with cooked food (57.1%)” and “the possibility of excrement germ contamination of the used diapers (62.0%)” and there was a significant difference in the distribution between a group that has had hygiene education and one that has not in all the items except for washing hands ($p < 0.05$, $p < 0.01$, $p < 0.001$). As for the food hygiene practice, the practice rate was low in the items such as “prohibition of wearing accessories (34.4%)”, “separate use of the cooking utensils for raw food and cooked food (14.7%)”, “checking expiration date (46.6%)” and “wearing hygiene gloves when distributing food (34.4%)”. And there was a significant distribution difference between a group that has had hygiene education and one that has not ($p < 0.001$) in three items such as “prohibition of wearing accessories”, “separate use of the cooking utensils for raw food and cooked food” and “wearing hygiene gloves when distributing food”. The results of this study show that a group with no hygiene education was worse in hygiene than the one with hygiene education in various items of the food hygiene knowledge, attitude and practice. Therefore, hygiene education is needed for all the staff members including the directors, teachers and cooks of the home child care centers and there also needs to be field education for safe management of meals for the children.

Key words: Home day care center, food hygiene, knowledge, attitude, practice, education

INTRODUCTION

With economic development and an increase in women's participation in society, the child care has become an issue on a national level in Korea and the role and the importance of the child care policy of the government to support women's economic activities and resolve the problem of low birth rate is getting bigger (Song and Woo, 2015). Day care centers make up the most of the nursery schools in our country with the number of home day care centers 23,318, accounting for 53.3% of 43,742 day care centers overall in 2014.

The home day care center is a day care center run by individuals in the smallest scale at home or a place equivalent to homes with 5-20 infants and children on a regular basis (Kwon and Park, 2012). According to the

food sanitation law in Korea, only a non-profit group that provides meals for more than 50 people on a regular basis is regarded as institutional foodservice establishments and for the home day care centers that provide food service for <20 children, there is no obligation to report as institutional food service establishments to the authority concerned based on food sanitation law, nor to hire food service management experts like dietitians (Kwak, 2006). Also, the problems of poor cooking facilities and negligence of hygiene management can easily occur in the kitchens of the small-scale home day care centers due to the financial and structural problems and lack of professional food knowledge (Kwon and Park, 2012; Kwak, 2006).

Children who go to day care centers are at higher risk of contracting intestine infection or respiratory diseases

(Lu *et al.*, 2004; Akihara *et al.*, 2005). Children are also more likely to contract food poisoning as the immune system of the children has not grown enough as adults and it is hard for them to protect themselves from the danger of foods (Buzby, 2001). But as for the researches on the food and safety of the children at day care centers, there were cases of analyzing the microbial harm of the kitchens and preparation places and places of meal distribution (Cosby *et al.*, 2008; Staskel *et al.*, 2007; Li *et al.*, 2014a, b) hand sanitation (Li *et al.*, 2014a; Kotch *et al.*, 2007; Zomer *et al.*, 2013a, b) and the research on the food safety practices targeting at the directors and staff members (Enke *et al.*, 2007) but the researches on the knowledge, attitude and practices about food safety were not done enough. Therefore, this study investigates the knowledge, attitude and practices about food safety targeting at the directors and teachers in home day care centers, aiming to raise the necessity of the management, education and PR about the safety of the food service provided for the children.

MATERIALS AND METHODS

Research subjects and duration: This study targeted at directors and teachers of the home day care centers in Cheongju area, conducting a survey to the directors and teachers who participated in the job training held by joint conference of Cheongju-si home day care centers. The questionnaires were distributed at the entrance of the training center before the training started. The researcher explained the meaning of the study and the method of filling out the questionnaires directly to the directors and teachers before the training and collected them after the training finished at the exit. Among 208 questionnaires collected, 163 were used for statistical analysis after excluding the ones with insufficient answers.

Survey contents and method: The questionnaire used for this study was made with reference to the previous researches on the knowledge, attitude and practices of the food handlers about food safety (Abdul *et al.*, 2012; Tokuc *et al.*, 2009; Parra *et al.*, 2014; Tan *et al.*, 2013; Meysenburg *et al.*, 2014; Cunha *et al.*, 2014). The questionnaire is composed of 4 parts including general aspects and knowledge, attitude and practices about food safety. The general items included gender, age, position, education, period of working, experience of hygiene education and the role in the food service. The position was to recognize directors and teachers and the role in the food service presented 4 cases such as a case of taking care of cooking, a case of helping with

cooking only when things are busy, a case of only distributing food and a case of not participating in cooking nor distributing food.

The questions about food hygiene knowledge had 8 questions including heating and cooking of food, diaper hygiene, food poisoning and digestive disorder. We gave 3 options of answers to the participants, “correct” “not correct” and “don’t know” and for the questions about the temperature of the refrigerator and freezer and the storage temperature of the hot and cold foods we had them mark among the temperatures presented or mark “don’t know.” The questions about food hygiene attitude had 7 questions including washing hands, crossover contamination, sanitary attire, wearing accessories and diaper hygiene while presenting 3 options of answers “yes”, “no” and “uncertain”. The questions about food hygiene practices had 6 questions including washing hands, wearing accessories, separate use of cooking utensils, confirmation of expiration date and wearing hygiene gloves while presenting options of answers “always”, “sometimes”, “never”.

Data analysis: For the statistical analysis, this study used SPSS ver. 18.0 for windows or Statistical Package for Social Science, SPSS Inc, Chicago, IL, USA). Also, the study got the frequency and percentage of each answer to the questions about general aspects, food hygiene knowledge, attitude and practices of the directors and teachers in the home day care centers. We conducted crossover analysis of the food hygiene knowledge, attitude and practice items regarding hygiene education and conducted logistic regressive analysis of the food hygiene knowledge, attitude and practice items while putting age, education and period of working as independent variables among the general aspects. Here, to make answers of the knowledge, attitude and practices dichotomous variables (‘safevs.unsafe’) the answers were categorized and recorded as for knowledge, “correct vs. not correct/don’t know” for attitude “yes vs. no/uncertain” and for practices “always vs. sometimes/never.”

RESULTS AND DISCUSSION

General aspects of research subjects: The general aspects of the surveyed directors and teachers in the home day care centers are as shown in Table 1. The gender of 163 people surveyed were all females and people in their 40s made up the most with 91 (55.8%), followed by people in 30s (26.4%). As for the position, there were 107 teachers (65.6%), outnumbering directors

Table 1: General characteristics of the respondents <N = 163>

Variables	N (%)
Gender	
Male	0 (0.0)
Female	163 (100.0)
Age (years)	
20-29	6 (3.7)
30-39	43 (26.4)
40-49	91 (55.8)
50-59	19 (11.7)
60-69	4 (2.5)
Position	
Director	56 (34.4)
Teacher	107 (65.6)
Education level	
High school	15 (9.2)
Junior college	80 (49.1)
4 year university	61 (37.4)
Graduate school	7 (4.3)
Experience of food hygiene education	
Yes	116 (71.2)
No	47 (28.8)
Period of working (yrs)	
<1	22 (13.5)
1 ≤ to <3	30 (18.4)
3 ≤ to <5	45 (27.6)
5 ≤ to <10	39 (23.9)
10 ≤ to <15	17 (10.4)
≥ 15	10 (6.1)
Role in the food service	
Cooking	23 (14.1)
Helping cook when busy	19 (11.7)
Distributing food	90 (55.2)
Doing nothing	31 (19.0)
Total	163 (100.0)

with 56(34.4%). For education, junior college graduates (80 people, 49.1%) and 4 years university graduates (61 people, 37.4%) took up the majority. For period of working, 3-5 years and 5-10 years made up the most with 45 people (27.6%) and 39 people (23.9%), respectively. As for the experience of hygiene education, 116 people (71.2%) answered “Yes”. The role in the food service for the children, 90 people were in charge of distributing food (55.2%), 23 were in charge of cooking (14.1%) and 19 or 11.7%) were helping with cooking only when in hectic times.

The food hygiene knowledge of the directors and teachers in the home day care centers: Table 2 shows the results of the crossover analysis of the food hygiene knowledge answers against hygiene education of the directors and the teachers in the home day care centers. The 89% of the directors and teachers in the home day care centers answered “cooking food in advance can cause food poisoning” and 84% answered “the diapers used for the children can generate poisoning bacteria”. But for the “proper temperature of the refrigerator,” only 35.6% answered correctly and 31.3% answered correctly for the “proper temperature of the freezer.” As for the “storage temperature of the cooked

food,” 9.8% answered correctly for the “hot food” while 36.2% answered correctly for the “cold food”. The result of conducting crossover analysis of the answers to the food hygiene knowledge regarding hygiene education, a group with hygiene education showed a significant difference with one with no hygiene education ($p < 0.001$) in the distribution of the correct answers for the items “the possibility of causing food poisoning by the cooks with digestive disorders,” “the proper temperature of the refrigerator and the freezer” and “the proper storage temperature of the cooked food”.

The food hygiene attitude of the directors and teachers in the home day care centers: The results of conducting the crossover analysis of the food hygiene attitude of the directors and teachers in the home day care centers against the hygiene education are as shown in Table 3. More than 90% of the participants showed sanitarily safe attitude about the items such as occupational responsibility (95.7%), washing hands (99.4%), separate storage of raw food and cooked food (90.8%). But about the items “prohibition of wearing accessories when handling cooked food” and “the possibility of excrement contamination of the used diapers”, only 57.1% and 62.0% answered “Yes”. The result of conducting crossover analysis of the food hygiene attitude against hygiene education shows that for all the items except “washing hands”, there was a significant difference in the distribution between a group with hygiene education and one with no hygiene education ($p < 0.05$, $p < 0.01$, $p < 0.001$).

The food hygiene practices of the directors and teachers in the home day care centers: Table 4 shows the results of the crossover analysis of the food hygiene practice against hygiene education of the directors and the teachers in the home day care centers. For the practice of “washing hands”, <90% of the participants answered “always” while there were less answers of “always” for the items “not wearing accessories when handling cooked food (34.4%)”, “separate use of the cooking utensils for the raw food and cooked food (14.7%)”, “confirmation of expiration date (46.6%)” and “wearing hygiene gloves when distributing food (34.4%)”. The result of crossover analysis of the food hygiene practices against hygiene education shows that there was a significant distribution difference between a group with hygiene education and one with no hygiene education in the items “prohibition of wearing accessories”, “separate use of the cooking utensils for the raw food and cooked food” and “not wearing accessories when handling cooked food” ($p < 0.001$).

Table 2: Respondent's food hygiene knowledge

Statements	Food hygiene education	Respondents N (%)			χ^2
		Correct	Not correct	Don't know	
K1; food poisoning (stomachache, diarrhea, etc.) can occur when food for dinner is cooked in the morning in advance	Yes	102 (87.9)	14 (12.1)	0 (0.0)	0.431
	No	43 (91.5)	4 (8.5)	0 (0.0)	
	Total	145 (89.0)	18 (11.0)	0 (0.0)	
K2; food poisoning can occur when we eat food cooked in the morning for dinner without boiling it properly (higher than 75°C)	Yes	106 (91.1)	10 (8.9)	0 (0.0)	0.001
	No	43 (91.5)	4 (8.5)	0 (0.0)	
	Total	149 (91.4)	14 (8.6)	0 (0.0)	
K3; food poisoning bacteria (colon bacillus, etc.) can inhabit the diapers used for the children	Yes	98 (84.5)	7 (6.0)	11 (9.5)	0.347
	No	39 (83.0)	4 (8.5)	4 (8.5)	
	Total	137 (84.0)	11 (6.7)	15 (9.2)	
K4; food poisoning can occur when participating in the cooking when having stomachache or diarrhea	Yes	106 (91.4)	6 (5.2)	4 (3.4)	18.850***
	No	32 (68.1)	3 (6.4)	12 (25.5)	
	Total	138 (84.7)	9 (5.5)	16 (9.8)	
K5; the proper temperature of the refrigerator is ()°C (ex. 1-5°C, 6-10°C, 11-15°C, 16-20°C)	Yes	50 (43.1)	41 (35.3)	25 (21.6)	12.718***
	No	8 (17.0)	30 (63.8)	9 (19.1)	
	Total	58 (35.6)	71 (43.6)	34 (20.9)	
K6; the proper temperature of the freezer is ()°C (ex. <-18°C, -15-10°C, -10-5°C, -5-1°C)	Yes	48 (41.4)	40 (34.5)	28 (24.1)	21.669***
	No	3 (6.4)	32 (68.1)	12 (25.5)	
	Total	51 (31.3)	72 (44.2)	40 (24.5)	
K7; the hot cooked food needs to be kept at ()°C before distribution (ex. 21-30°C, 31-40°C, 41-50°C, 51-60°C, 61-70°C)	Yes	14 (12.1)	58 (50.0)	44 (37.9)	11.399***
	No	2 (4.3)	37 (78.7)	8 (17.0)	
	Total	16 (9.8)	95 (58.3)	52 (31.9)	
K8; the cold cooked food needs to be kept at ()°C before distribution. (ex.<1°C, 1-5°C, 10°C, 15°C, 20°C)	Yes	54 (46.6)	24 (20.7)	38 (32.8)	31.525***
	No	5 (10.6)	33 (70.2)	9 (19.1)	
	Total	59 (36.2)	57 (35.0)	47 (28.8)	

***p<0.001

Table 3: Respondent's food hygiene attitudes

Statements	Food hygiene education	Respondents N (%)			χ^2
		Yes	No	Uncertain	
A1; safe management of food is an important part in my job responsibilities	Yes	115 (99.1)	0 (0.0)	1 (0.9)	15.709***
	No	41 (87.2)	6 (12.8)	0 (0.0)	
	Total	156 (95.7)	6 (3.7)	1 (0.6)	
A2; it is important to have food hygiene education for my job (nursery staff member)	Yes	95 (81.9)	1 (0.9)	20 (17.2)	26.252***
	No	7 (14.9)	0 (0.0)	40 (85.1)	
	Total	102 (62.6)	1 (0.6)	60 (36.8)	
A3; we must wash our hands before handling food to reduce the risk of food contamination	Yes	115 (99.1)	1 (0.9)	0 (0.0)	0.408
	No	47 (100.0)	0 (0.0)	0 (0.0)	
	Total	162 (99.4)	1 (0.6)	0 (0.0)	
A4; raw food and cooked food need to be kept separately	Yes	111 (95.7)	5 (4.5)	0 (0.0)	11.523**
	No	37 (78.7)	10 (21.3)	0 (0.0)	
	Total	148 (90.8)	15 (9.2)	0 (0.0)	
A5; the risk of food contamination can be reduced if we wear hygiene gloves, masks, caps and aprons when handling the cooked food such as distribution	Yes	106 (91.4)	6 (5.2)	4 (3.4)	7.480*
	No	39 (83.0)	1 (2.1)	7 (14.9)	
	Total	145 (89.0)	7 (4.3)	11 (6.7)	
A6; foods can be exposed to contamination if we wear accessories such as rings and watches when handling the cooked food such as distribution	Yes	90 (77.6)	2 (1.7)	24 (20.7)	24.483***
	No	3 (6.4)	13 (27.7)	31 (66.0)	
	Total	93 (57.1)	15 (9.2)	55 (33.7)	
A7; we need to wash our hands after changing the diapers to reduce the contamination caused by excrement bacteria	Yes	99 (85.3)	0 (0.0)	17 (14.7)	28.682***
	No	2 (4.3)	8 (17.0)	37 (78.7)	
	Total	101 (62.0)	8 (4.9)	54 (33.1)	

*p<0.05, **p<0.01, ***p<0.001

The effects of the demographic characteristics of the participants on the food hygiene knowledge, attitude and practices: To examine the effects of the demographic characteristics of the participants on the food hygiene knowledge, attitude and practices, the study conducted logistic regressive analysis while putting the age, period of working and education as dependent variables and food hygiene knowledge, attitude and practices as dependent variables or safe/unsafe), presenting only the results with statistical significance in Table 5. Age had a

significant effect on the knowledge about food poisoning bacteria contamination of the used diapers and on the practice of washing hands after using diapers. The younger the age, the more knowledge they had about the existence of the food poisoning bacteria on diapers. But younger people had lower practice rate of washing hands after using diapers. Higher education and longer period of working had a significant relationship with the temperature of the refrigerator as the education level was higher and the period of working was longer,

Table 4: Respondent’s food hygiene practices

Statements	Food hygiene education	Respondents N (%)			χ ²
		Always	Sometimes	Never	
P1; I absolutely wash my hands before cooking or distributing food	Yes	111 (95.7)	5 (4.3)	0 (0.0)	2.090
	No	47 (100.0)	0 (0.0)	0 (0.0)	
	Total	158 (96.9)	5 (3.1)	0 (0.0)	
P2; I absolutely wash my hands after going to the bathroom or changing diapers	Yes	111 (95.7)	5 (4.3)	0 (0.0)	1.131
	No	43 (91.5)	4 (8.5)	0 (0.0)	
	Total	154 (94.5)	9 (5.5)	0 (0.0)	
P3; I do not wear rings or watches when cooking or distributing	Yes	54 (46.6)	58 (50.0)	4 (3.4)	26.798***
	No	22 (4.3)	41 (87.2)	4 (8.5)	
	Total	56 (34.4)	99 (60.7)	8 (4.9)	
P4; I separately use the dishes and utensils (knives, cutting boards) that handle the raw foods and cooked foods	Yes	21 (18.1)	47 (40.5)	48 (41.4)	28.706***
	No	3 (6.4)	3 (6.4)	41 (87.2)	
	Total	24 (14.7)	50 (30.7)	89 (54.6)	
P6; I absolutely check the expiration date on the wraps of the processed food	Yes	53 (45.7)	63 (54.3)	0 (0.0)	0.001
	No	23 (48.9)	24 (51.1)	0 (0.0)	
	Total	76 (46.6)	87 (53.4)	0 (0.0)	
P8; I absolutely wear hygiene gloves when distributing food	Yes	53 (45.7)	63 (54.3)	0 (0.0)	27.055***
	No	3 (6.4)	23 (48.9)	21 (44.7)	
	Total	56 (34.4)	86 (52.8)	21 (12.9)	

***p<0.001

Table 5: Effect of demographic characteristics on knowledge, attitude and practice (logistic regression analysis)

Independent variables	Wald	p-values	Adjusted odds ratio	95% CI
Knowledge(safe/unsafe); K3				
Age ^{d)}	5.286	0.021	1.927	1.102-3.370
K4				
Duration of work ²⁾	7.941	0.005	0.601	0.421-0.856
K5				
Education level ³⁾	5.121	0.024	0.568	0.348-0.927
Duration of work	11.931	0.001	0.63	0.480-0.829
Attitude safe/unsafe; A2				
Duration of work	22.071	0.000	0.499	0.374-0.667
Duration of work	18.409	0.000	0.557	0.426-0.727
A6				
Duration of work	17.012	0.000	0.565	0.431-0.741
A7: Practice safe/unsafe; P2				
Age	7.745	0.005	0.253	0.096-0.666

¹⁾ ①20s ②30s ③40s ④50s ⑤60s; ²⁾ ①<1 ②1= ≤ to <3 ③3= ≤ to <5 ④5 = ≤ to <10 ⑤10 = ≤ to <15 ⑥ ≥ = 15(years); ³⁾ ① High school ② College ③ University ④ Graduate school

they knew the temperature of the refrigerator more correctly. The period of working had a significant effect on the food hygiene attitude of 3 items as the period of working was longer they thought that the hygiene education for the nursery staff members was important and showed safe food hygiene attitude toward washing hands after using diapers and wearing accessories.

This study tried to examine the necessity of the hygiene education and the safety management of the food service provided for the children by investigating the knowledge, attitude and practices of food safety, targeting at the directors and teachers of the home day care centers in Cheongju area. The directors and teachers of the home day care centers in Cheongju area had a relatively safe knowledge level about food poisoning but they lacked knowledge about “the proper temperature of

the refrigerator (35.6%) and the freezer (31.3%)” and “the proper storage temperature of the hot cooked food (9.8%) and cold food (36.2%) which was in line with the result of the researches by Buccheri and Tokuc *et al.* (2009). The fact that the food handlers are not well aware of the food storage temperature shows that management of temperature which is one of the important management methods for preventing food poisoning is not properly done, suggesting the necessity of education related to food hygiene (Toku *et al.*, 2009; Meysenburg *et al.*, 2014).

The group with hygiene education in this study showed significantly high knowledge about “the possibility of causing food poisoning by the cooks with digestive disorders,” “the proper temperature of the refrigerator and freezer” and “the proper temperature of the cooked food”. This is similar to the result of research by Cunha *et al.* (2014) who investigated the effects of the hygiene education and claimed that hygiene education has a significant effect on the food hygiene knowledge and that education should happen at least once every 6 months to one year to keep it remembered. There were many cases of unsafe attitude in the items “prohibition of wearing accessories when handling cooked food” and “the possibility of excrement bacteria contamination of the used diapers”. According to Cosby *et al.* (2008) and Li *et al.* (2014b), the possibility of excrement bacteria contamination caused by the diapers in day care centers can be reduced dramatically when the hygiene management is thoroughly performed. Therefore, if the hygiene education and practices about intense hygiene management of used diapers and washing hands are done in the home day care centers, hygiene safety for the children will be improved.

For the food hygiene practices, the group with no hygiene education showed less cases of hygiene practices in the items “prohibition of wearing accessories”, “prevention of crossover contamination” and “wearing hygiene gloves when distributing food”. According to Staskel *et al.* (2007), after examination of the micro-organism in day care centers, bacteria was detected in 41% of the samples and most of the microorganisms detected could do damage to the children with low immunity. As crossover contamination of food poisoning bacteria that exist in raw foods can occur in the course of cooking and distributing, intense hygiene management and education are needed (Cosby *et al.*, 2008; Staskel *et al.*, 2007; Cunha *et al.*, 2014).

CONCLUSION

Targeting at the directors and teachers of the home day care centers in Cheongju area, this study tried to examine the necessity of the hygiene education and the safety management of the food service provided for the children by investigating the knowledge, attitude and practices of food safety. The result of the study shows that the directors and teachers had a relatively safe knowledge level about food poisoning but they lacked knowledge about the proper temperature of the refrigerator and freezer and the proper storage temperature of the hot cooked food and cold food. As for the food hygiene attitude, they showed unsafe attitude toward the prohibition of wearing accessories when distributing food and the possibility of excrement bacteria contamination of the used diapers. As for the food hygiene practices, washing hands was satisfactory but the sanitary practices of wearing accessories, prevention of crossover contamination, confirmation of expiration date and wearing hygiene gloves when distributing food were not satisfactory. Especially the group with no hygiene education showed lower hygiene level than the group with hygiene education in many items from food hygiene knowledge, attitude and practices. Therefore, hygiene education for all the staff members including directors, teachers and cooks of the home day care centers is needed and along with this, the field education needs to be conducted for the safe food service management for children.

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